

PATENT ABSTRACTS OF JAPAN

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(54) PRODUCTION OF MEAT PRODUCT

(57)Abstract:

PURPOSE: To promote the aging of meat at low temperatures and correct a strange taste and an offensive smell derived from raw material meat or a secondary raw material by adding a fermented dairy product to the raw material meat.

CONSTITUTION: The method for producing a meat product is to add a fermented dairy product to raw material meat, promote the aging of the meat at a temperature as low as $\leq 5^{\circ}\text{C}$ and correct a strange taste and an offensive smell. The meat product is produced by adding 0.1-10 pts.wt., preferably 1-3 pts.wt. fermented dairy product to 100 pts.wt. raw material meat. The fermented dairy product is prepared by using a lactic acid bacterium (the genus Lactobacillus, Lactococcus, etc.) or an yeast (the genus Saccharomyces, etc.).

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[Scope of Claim]

[Claim 1] A method of production of a meat product in which aging of the meat at low temperature is promoted and a strange taste and offensive smell derived from the raw material meat or secondary raw material is corrected by adding a fermented dairy product to the raw material meat.

[Claim 2] A method of production of a meat product according to Claim 1, whereby the proportion of the fermented dairy product added is 1-10wt.% part of 100wt.% raw material meat.

[Claim 3] A method of production of a meat product according to Claim 1, whereby the temperature at which aging takes place is 1-15°C.

[Claim 4] A method of production of a meat product according to Claim 1, whereby the microorganisms used in preparation of the fermented dairy product are selected from one, or more than two of, the following: lactic acid bacteria belonging to genus *Lactobacillus*, genus *Lactococcus*, genus *Leuconostoc* or genus *Pediococcus*; and/or yeast belonging to genus *Saccharomyces*.

[Claim 5] A method of production of a meat product according to Claim 1, whereby the solid content of the fermented product is less than 10wt.% of the fermented liquid, or less than 30wt.% of the fermented powder.

[Detailed description of the invention]

[0001]

[Industrial Field of Application] This invention concerns a method for the production of a meat product. In detail, it concerns a method for production of a meat product in which the flavour is improved by the use of a fermented dairy product.

[0002]

[Conventional Technology] In the past, lactic acid bacteria or yeast have been used in order to improve the flavour of food products and to increase their preservability. Examples of the effect of these microorganisms on the aging of meat products can be seen in dry sausage and in reported use of lactic acid bacteria in the production of ham ('Chem. Mikrobiol Technol. Lebens', Vol 9, 5, 131, 1986). Furthermore, unexamined patent application 4-234963 discloses a method of production of a processed cattle meat product, whereby preservability is increased and the period for aging is shortened by adding lactic acid bacteria possessing halo-tolerance and anti-bacterial qualities to the cattle meat.

[0003] Moreover, various lactic acid bacteria starters (lactic acid bacteria powder) intended for improving taste and promoting the aging of meat are commercially available ('Starter Cultures', pub. Rudolfmuller).

[0004] Many seasonings, including various spices and amino acid fermented liquids, are used to improve the flavour of meat products, with the aim of correcting a cattle meat smell and contributing to the aged flavour.

[0005]

[Issue to be solved by the invention] Lactic acid bacteria and yeast in processed meat products are used in the US and Europe in the form of freeze-dried powder and freeze-concentrated products in order to improve the quality of the product and shorten the aging period. However, these meat products are fermented and aged at medium-high temperatures of 25-37°C. In Japan, production is premised on low-temperature (5-10°) curing and aging, which at present would make the use of such microorganisms difficult.

[0006] Furthermore, in processed meat production lines, there is at present a trend away from the use of live bacteria, including lactic acid bacteria and others, in consideration of the effect this has on other products.

[0007] Further, secondary raw materials used generally in processed meat products with the same aim as outlined above, including spices, seasonings, vegetable protein and casein mixtures, themselves make up the flavour of the processed meat product without detracting from the aged flavour or deliciousness of the meat, so rounding off the overall flavour of the product.

[0008] Consequently, convenient materials and a production method that facilitate the use of microorganisms in meat without altering the conditions for production, in particular the temperature at which aging (curing) takes place, are required.

[0009]

[Means to solve the issue] The inventors have carried out various studies using lactic acid bacteria and yeast removed from conventional lactic acid bacteria starters, various dairy products and fermented food products. The degradation of protein, in other words the idea that [the meat] is aged, is set out by Hoagland and others ('Journal Food Science', 34, 196, 1969). A study was made of the effect of promoting aging as follows: taking a protein degradation, 100g pork thigh meat was kept at 5, 10 and 25°C for 24-72 hours, and the amino acid (freed by the action of the microorganisms and their fermented substance) was then measured as tyrosine. The difference between the product with no additive, after 72 hours at 5°C, and that with a quantity of free amino acid, was 0.06 μmol in the case of the said starter, in contrast to 0.27 μmol in the case of the fermented substance, and 0.22 μmol after fermentation and heat-pasteurisation. The higher the temperature at which aging is carried out, the lower the differential becomes, there being almost no difference at 25°C. Instead of adding microorganisms to the meat product as a freeze-dried powder or concentrate-starter, followed by fermentation and aging, a fermented liquid and fermented powder were prepared, and were added to the processed meat product in a form comprising various bioactive substances. Study of this showed that aging of the meat was promoted at low temperatures (less than 5°C).

[0010] Furthermore, even when using microorganisms in dairy products that have been pasteurised, i.e. the number of live bacteria in the fermented dairy products was zero, aging was promoted. Where the product contained live bacteria, we found the effect to be even greater. The mechanism underpinning the reason for promotion of aging by such dairy products is not clear, but given that an effect is acknowledged even when the number of live bacteria is zero, we may consider the use of organisms in dairy products and the employment of dairy sourced elements as materials.

[0011] Moreover, we confirmed a synergistic effect when combined with other seasonings, the correction of a smell and promotion of aging by adjusting the quantity of solid content in the fermented dairy product, which resolves the problem. This invention was completed on the basis of such knowledge.

[0012] In other words, this invention is concerned with a method of production of a meat product in which aging of the meat at low temperature is promoted and a strange taste and offensive smell derived from the raw material meat or secondary raw material is corrected by adding a fermented dairy product to the raw material meat.

[0013] The raw material meat used in this invention is not especially limited in scope, presuming the use of generally available foods, such as beef, pork, sheep, goat, domestic rabbit, chicken, fish etc. Further, the microorganisms used in preparation of the fermented dairy product may comprise a mixture of one, or more than two of, the following: lactic acid bacteria strains, e.g. genus *Lactobacillus*, genus *Lactococcus*, genus *Leuconostoc*, genus *Pediococcus*; and/or yeast strains belonging to genus *Saccharomyces*.

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Lactic acid
product

[0014] The fermented dairy product is added preferably in a proportion of 0.1-10 wt.% to 100wt.% raw material meat, 1-3 wt.% being even more desirable. If the quantity of the additive is less than 0.1 wt.%, the effect is insufficient, and if the quantity added exceeds 10 wt.%, the meat exudes a strong raw fermented smell, coming from the fermented dairy product, making it unpleasant.

[0015] The proportion of solid content in the fermented dairy product should ideally be less than 10 wt.%, with 5-10 wt.% even more desirable. If it exceeds 10 wt.%, the viscosity of the liquid increases, making it difficult to handle, and a dairy flavour remains in the meat. In the case of the fermented powder, less than 30 wt.% is preferable, with 20-30 wt.% even more desirable. If it exceeds 30 wt.%, a dairy smell remains in the meat, as with the fermented liquid.

[0016] The fermented dairy product can include fermented cow milk or skimmed milk, or pasteurised milk. These can be employed alone or in combinations of two or more. Fermented powder means a dried product, obtained by extracting almost all of the water within the fermented milk by such methods as heating and freeze-drying. According to the method of preparation used, the substance produced may be granular, or a compound made up of edible substances such as dextrin. Further, the temperature at which the meat is aged within the production process of this invention is preferably 1-15°C, 5-10°C being even more desirable.

[0017]

[Examples] The invention is described below in further detail with the use of examples, although it is not limited solely to these examples. Furthermore, '%' shall generally mean wt.%.

[0018] Reference Example 1: Preparation of a fermented dairy product

10% reduction skimmed milk medium was inoculated with 1% *Lactobacillus helveticus* K-4 (Fermentation Research Institute, No. 12249) culture medium, and cultured at 30°C for 24 hours, this used as the fermented milk. This was made into pasteurised milk after sterilising at 95°C for 10 minutes. 25% dextrin was added to the fermented liquid, following which it was heat spray-dried and a fermented powder obtained therefrom.

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[0019] Practical Example 1: Preparation of ham

300g of a pickling liquid, including/not including fermented milk, pasteurised milk and fermented powder produced as described in Example 1 above, was added to 1kg of pork thigh meat (as in Table 1) and cured at 5°C. The above fermented milk, pasteurised fermented milk and fermented powder were added to the pickling liquid so as to each amount to 1% of the meat. After curing for periods of 1, 3 and 7 days, the ham was prepared using standard methods, each of the hams were assessed for flavour and feel, and the free amino acid constituting the flavour element was measured according to the method set out by Roth and others ('Analytical Chemistry', 43, 880, 1971). Furthermore, nucleic acid-related substances were measured according to the method set out by Uchiyama and others ('Bulletin Japan Society Science Fish', 36, 177, 1970). As a comparison, a product was prepared without the addition of any fermented milk etc. The results of the flavour and feel assessment for each of the hams is shown in Table 2. Table 3 shows the quantity of glutamic acid, alanine and total quantity of free amino acid, which is taken to contribute to improvement of the aged flavour. Table 4 shows the result of the measurement of nucleic acid-related substances.

[0020] Table 1

Composition of the pickling liquid (%)

	No Additive	Category 1	Category 2	Category 3
Spice mixture	0.03	0.03	As left	As left
Sodium chloride	6.00	6.00	As left	As left
Phosphate	2.40	2.40	As left	As left
Sodium nitrate	0.02	0.02	As left	As left
High-grade sugar	1.30	1.30	As left	As left
Water	90.25	87.25	As left	As left
Fermented milk	-	3.00	-	-
Pasteurised fermented milk	-	-	3.00	-
Fermented powder	-	-	-	3.00

[0021] Table 2
Assessment of each of the hams

Test	Days	Correction of cattle meat smell	Aged Flavour	Eating sensation
No Additive	1	×	×	×
	3	ρ	ρ	ρ
	7	†	ρ - †	ρ
Fermented milk	1	ρ	ρ	×
	3	†	†	ρ
	7	†	†	†
Pasteurised fermented milk	1	ρ	ρ	×
	3	†	ρ - †	ρ
	7	†	†	†
Fermented powder	1	†	ρ	×
	3	†	†	ρ
	7	†	†	†

× = almost no effect felt

ρ = slight effect felt

† = effect felt, the unique fibrous texture of the ham sensed when eating

[022] Comparing the aged flavour of meat, to which fermented milk had been added, with meat where none had been added, the flavour was expressed at half the aging period, after curing for 1 day there was slight correction of the cattle meat smell, and after 3 days the difference was clearly noted. With no additive and after 7 days' curing, there was no sense of the fibrous texture of the meat when eaten, but with the additive it was clearly sensed. The fermented milk was confirmed not only to have improved the flavour, but also to have had an effect on the physical properties of the ham.

[0023] Table 3

Glutamic acid, aranine and free amino acid in each of the hams

Test	Days	Glutamic acid	Aranine	Free amino acid
No Additive	1	2.13	3.34	15.73
	3	2.94	3.44	19.32
	7	3.06	3.73	23.72
Fermented milk	1	2.50	3.42	17.06
	3	3.39	5.84	29.55
	7	3.51	5.66	26.01
Pasteurised fermented milk	1	2.22	3.55	16.44
	3	3.47	4.09	26.73
	7	3.42	4.41	27.20
Fermented powder	1	2.25	3.94	19.12
	3	3.61	5.60	21.40
	7	3.90	5.70	31.56

[0024] Free amino acid increases in each of the hams, according to the length of curing undertaken, a greater increase being seen in the case of ham with the addition of fermented milk, which had the effect of underpinning the flavour assessment.

Table 4: Nucleic acid-related substances in each of the hams ($\mu\text{mol/g}$) & K Values*

Test	Days	IMP*	Hx	K Value
No Additive	1	7.92	1.13	39.0
	3	6.87	1.21	46.1
	7	5.70	1.42	53.3
Fermented milk	1	7.05	1.07	41.6
	3	6.02	1.42	53.9
	7	4.14	1.56	54.8
Pasteurised fermented milk	1	7.45	1.13	42.9
	3	6.26	1.39	52.8
	7	5.01	1.52	55.5
Fermented powder	1	7.42	1.22	45.2
	3	5.44	1.53	56.8
	7	4.38	1.75	57.4

* K Value: Inosin (HxR) and hypoxanthine (Hx) as a percentage of the total quantity of the nucleic acid-related compound, calculated as follows:

$$\text{K Value} = \frac{\text{HxR} + \text{Hx}}{\text{ATP} + \text{ADP} + \text{AMP} + \text{IMP}} \times 100$$

[0026] Transformation of the nucleic acid-related compound within the aging pork steadily reduces as a result of a rapid increase in IMP immediately after slaughter, and the increase in Hx and HxR has been shown by Terazaki and others ('Agricultural Biological Chemistry' 29, 208, 1965). Furthermore, Kawamura and others (Japanese Society for the Food Industry [present name: Japanese Society for Food Science & Technology] publication 30, 488, 1983) claim that the degree of aging of processed meat products can be gauged from the K values employed in the index for measuring the degree of freshness of fish.

[0027] Through the addition of the fermented milk, the IMP reduces, the rate of Hx increase rises and the K value increases. The increase in the K value demonstrates the fermented milk's function in the promotion of the meat aging.

[0028] Practical Example 2: Preparation of sausage

250g of a pickling liquid, including/not including fermented milk produced as described in Example 1 above, was added to 1kg of pork thigh meat (as in Table 5), and after suction-removing the liquid, it was filled into a casing. After aging for 3 days at 5°C, it was steam-pasteurised and the flavour assessed.

[0029] Table 5

Composition of the sausage pickling liquid (%)

	No Additive	Additive
Spice mixture	0.10	As left
Sodium chloride	10.00	As left
Phosphate	2.00	As left
Sodium nitrate	0.13	As left
Sodium ascorbate	0.40	As left
Dextrin	10.00	As left
Vegetable protein / Casein mixture	5.00	As left
High-grade sugar	5.00	As left
Fermented milk	-	5.00
Cold water	67.37	62.37

[0030] The pH of the cured meat and prepared sausage is shown in Table 6. There is no difference between the pH of either experiment, and no acidic flavour or smell was noted from the addition of fermented milk. Furthermore, whereas with no additive a vegetable protein smell was sensed, in the case of the fermented milk of this invention, the vegetable protein and casein smell were corrected. There was a full-bodied and aged quality to the flavour.

[0031] Table 6
pH in cured meat and sausage

	No Additive	Additive
Cured Meat	6.06	5.97
Sausage	6.12	6.05

pH 6

[0032] Reference Example 2: Preparation of a fermented dairy product

The preparation of fermented milk with lactic acid bacteria and yeast was carried out as follows: 10% reduction skimmed milk medium, comprising 1% glucose, was inoculated with a cultured medium of *Lactobacillus helveticus* K-4 as above, and *Saccharomyces cerevisiae* (IAM4274). This was then cultured at 30°C for 24 hours, and the resulting substance used as the yeast and fermented milk mixture.

[0033] Practical Example 3: Preparation of a hamburger

The composition of the raw material is shown in Table 6. Fried onion was mixed together with other materials, including meat, and after shaping and heat preparation, the flavour was assessed. The yeast and fermented milk mixture used was that obtained in Example 1.

[0034] Table 7
Composition of the hamburger (%)

	No Additive	1% Added	3% Added
Mincemeat	65.0	As left	As left
Onion	15.0	As left	As left
Breadcrumbs	7.5	As left	As left
Vegetable protein	7.0	As left	As left
Sodium chloride	0.5	As left	As left
Egg	1.0	As left	As left
Glutamic acid soda	0.5	As left	As left
Spice mixture	0.5	As left	As left
Water	3.0	2.0	-
Yeast & fermented milk mixture	-	1.0	3.0

[0035] Table 8

Result of assessment of the hamburger

	Correction of cattle meat smell	Vegetable protein smell	Flavour	Assessment
No Additive	×	×	ρ	Meat and vegetable protein smell noted, compliments the spice mixture.
1% added	↓	↓	↓	Cattle meat smell corrected, flavour is rounded off.
3% added	↓	↓	≡	In addition to correcting the cattle meat smell, a flavour with plenty of body is produced.

In hamburgers where the meat had not been aged, the effect of correction of the cattle meat smell and vegetable protein smell was considerable, and the alcohol aroma of the fermented yeast heightened the effect. Furthermore, the effect of spices and other seasonings in rounding off the flavour was confirmed.

[0036]

[Effect of the Invention]

According to this invention, by adding a fermented dairy product to raw material meat, aging of the meat can be accelerated at temperatures as low as 1-15°C, and a strange taste and offensive smell in the raw material meat can be corrected, presenting a meat product with an improved flavour.